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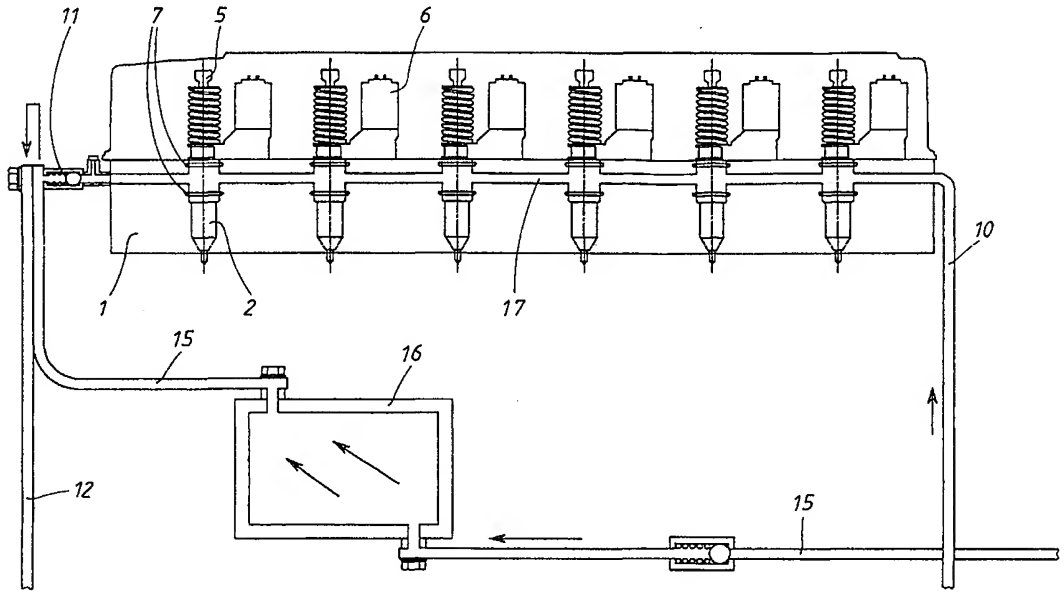

(57) Abstract

The present invention relates to a longitudinal cylinder head (1) for mounting on, for example, a diesel engine having cavities (18) for injection units (2) and supply means for liquid fuel. The invention is characterized by only one longitudinal fuel passage (17) for supply of fuel to all injection units (2).

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TITLE:

Elongated cylinder head for mounting on for instance a diesel engine having cavities for injection units and supply means for liquid fuel.

TECHNICAL FIELD:

The present invention relates to a cylinder head for mounting on, for example, a diesel engine, which cylinder head is provided with cavities for injection units for fuel into the engine and supply means for liquid fuel. Such cylinder heads have an elongated shape and are intended to be mounted on preferably the top side of an engine having several cylinders, e.g. six.

PRIOR ART:

Engines which are driven by liquid fuel, e.g. diesel oil, usually include a plurality of cylinders which at a regulated rate shall be provided with fuel by an injection nozzle and sufficient air for the combustion and must have an outlet for the exhaust gases. These functions are usually collected in a cylinder head which is mounted as a cover on the cylinders. Since the cylinders stand in a row, the cylinder head will be elongated.

The cylinder head is mostly moulded with completed passages for air and exhaust gases and possibly cavities for the fuel injection units. These cavities may also be bored. However, something that is always necessary is to bore passages for supply of fuel to the cavities for the fuel injection units. These passages, of which there are two, normally have a diameter of approximately 9,5 millimetres and they must run at a certain, short distance from each other through the whole length of the cylinder head. The passages are bored usually from the ends of both short

sides. Since fuel from these passages is to be forced into the fuel injection units, it is necessary to seal the passages both from each other and from the surroundings. Three surfaces which seal against O-rings have therefore been mounted on the injection unit, one below the lowermost passage, the second between the passages and the third above the uppermost passage.

One of the passages, preferably the lower one, is intended to feed fuel to the fuel injection units, whereas the second passage is intended for surplus fuel and to lead this in the opposite direction to that which the fuel has in the first passage and to maintain a certain pressure in the system. The pressure level is controlled by a valve mounted in connection to the second passage.

The amount of fuel which is to be injected into the engine is portioned out through the injection units. However, the total amount of these portions is much lower than the circulating amount, which is about four to eight times the total injected amount.

TECHNICAL PROBLEM:

The space in the cylinder head is limited since it shall include both the inlet and the exhaust gas passages for the engine and also cooling passages. Two fuel passages will therefore result in the dimension of these and further passages having to be limited. The limited space does not allow for desired freedom for designing these.

As a result of the small dimension of the bores working difficulties will arise, since it is difficult to maintain a straight and accurate direction in a bore having a small diameter and a great length, usually in the order of 1 m. As a consequence of this, a high incidence of rejects of

the cylinder heads will arise and a high level of process conducting will be required, which together will result in high production costs.

With two passages, four outlets in every injection cavity will also be obtained, which outlets (or inlets) must be deburred so that impurities in the form of burrs will not come out into the fuel and cause damage to the impurity-sensitive injection units. This deburring requires great attention, care and accuracy and has a negative influence on the production costs.

Various fuels which can be used in the engine are temperature-sensitive and the lubricating capability etc. is negatively influenced by a too high temperature, and leading to operational disturbances. The cooling liquid and the greasing oil in and around the cylinder head heat the fuel which is transported through the borings in the cylinder head and it is therefore of great importance that the heat transfer between the colder fuel and the surroundings will be as small as possible. With two passages each having a diameter of normally 9,5 mm and a length of 1 m a projected heat transfer surface of about 60 000 mm^2 will be obtained.

THE SOLUTION:

According to the present invention, the above problems have been solved by means of an elongated cylinder head for mounting on, for example, a diesel engine having cavities for injection units and means for supplying liquid fuel, such as diesel oil, to these units, as well as the usual air and cooling passages, if required. The cylinder head is characterized by having only one longitudinal fuel passage for feeding of fuel to and removing of fuel from all injection units.

According to the invention, it is suitable that the fuel passage ends in one or both of the shorter sides of the elongated cylinder head.

According to the invention, one or more transverse passages for feeding or removing of fuel to or from the longitudinal passage may however be arranged at one or both of the ends of the longitudinal fuel passage.

According to the invention, a valve for controlling the pressure of the fuel in the longitudinal fuel passage may be arranged therein at the outlet end for the fuel or outside the passage.

Further, it is suitable, according to the invention, that the longitudinal fuel passage has a diameter of 10-15 mm.

According to the invention, only two surfaces for sealing against O-rings mounted on the injection units may be made in each cavity for the injection units, one above and one below the inlet and outlet openings for the longitudinal fuel passage.

FIGURE DESCRIPTION:

The invention will in the following be described more in detail in connection with the attached figures where

fig. 1 schematically shows a flow sheet for fuel with a cylinder head according to the prior art, where

fig. 2 in an enlarged scale shows a part of the flow sheet according to fig.1, but with a cylinder head according to the present invention, and where

fig. 3 shows a view from above of a cylinder head according to the present invention and a longitudinal section and a cross-section of the cylinder head along the lines B-B and A-A.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT:

Fig. 1 shows schematically and in section a cylinder head 1. Six cavities are arranged in the cylinder head in this present case, which cavities each house an injection unit 2. These injection units 2 are supplied with fuel through two passages 3 and 4. The passage 3 is the main supply passage whereas the passage 4 is intended for overflow fuel. By means of a cam shaft that is not shown, a piston is pressed by a pin 5 against a spring force down into the injection unit 2 and causes the injection. The amount of injected fuel and the time for this injection is controlled by means of valve arrangement 6 shown schematically. When the piston is going upwards in the injection unit 2 fuel is sucked into this unit via a hole in the cylinder wall or a suitable valve arrangement.

It is important that the fuel flows in the cylinder head 1 are kept separated in a regulated way and therefore three O-rings 7 in grooves on the units 2 have been arranged. These O-rings 7 are located above the passage 4, below the passage 3 and between the two passages.

The pressure in the fuel system is made by means of a pump 8 which, via a filter 9 and a conduit 10, presses the fuel into the cylinder head 1. The pressure in the conduit 10 may be in the region of 3-4 bar and it is regulated by a valve 11. The fuel which flows out against the pressure in the pressure controlling valve 11 arrives via the conduit 12 back into the pump 8. From the pump 8 a conduit 13 also leads to the fuel tank 14 wherefrom fuel is sucked up

through the conduit 15 and via a cooling arrangement 16 is united with the outgoing flow from the cylinder head 1 at the pressure valve 11.

The amount of fuel which is pumped through the conduit 12 is much larger than the amount of fuel used and in the order of 2-12 lit/min. The amount of fuel which is sucked up from the fuel tank 14 through the conduit 15 will be in the order of 0,2-1,5 l./min. The conduit 13 and the throttle 21 are an arrangement for removing possible gas in the system.

The longitudinal passages 3, 4, which may have a length of in the order of 1 m, are drilled from each end usually by means of a gun boring drill. It is of the utmost importance that the two passages 3, 4 end in the cavities for the fuel injection units 2 at a correct location. This is of course difficult to bring about since the passages are long as well as narrow, usually 1 m and 9,5 mm. To ensure that the outlets into the cavities for the fuel injection units 2 shall be clean from splinters they must be deburred. There are two passages 3 and 4 and three O-rings 7, which causes the deburring and fine treatment work to be rather costly.

According to the prior art which is shown in fig. 1, the fuel supply is arranged at the rear of the cylinder head. If the engine is installed in a vehicle and, as is usual, is not horizontal but sloping slightly backwards, this will make it difficult for any gas in the system to be transported out since, according to the laws of nature, it will try to rise to the highest point in the engine. This results in some cases in difficulties in bleeding gas from the system in connection with repairs, etc. when the system is emptied of fuel. In fig. 1 the rear side of the cylinder head 1 is to the right in the figure.

In fig. 2 a fuel supply arrangement having a cylinder head 1 according to the present invention is shown in an enlarged scale. The reference numerals in this figure refer to the same elements as those in fig. 1. The difference between the cylinder head in this figure and the one according to the prior art according to fig. 1 is that here only one fuel supply passage 17 exists in the cylinder 1. Thereby, the construction of the cylinder head is simplified. Only one through flowing direction for fuel is obtained and only two O-rings 7, one on each side of the fuel passage 17, are needed.

The supply of fuel to the cylinder head 1 occurs in this case at the rear side of the cylinder head 1 through the conduit 10 and access fuel is taken out at the front side where the pressure fuel 11 is arranged. Since only one passage 17 is necessary according to the present invention, this passage may be made with a larger diameter than when two passages 3 and 4 are drilled. The passage 17 usually has a diameter of 12,5 mm but it may vary between 10 and 15 mm. The reason for this is that only one passage is present, which of course requires less space than when two passages must be made. When two passages 3, 4 are made according to the prior art, these must have a certain distance from each other so that a sufficient material thickness may be obtained. This results in the fact that other passages such as air passages for the combustion air and exhaust passages which also must have a certain wall thickness compared to the surroundings must be made in such a way that they do not give optimal flow of the air and the exhaust gases. In the arrangement according to the present invention, with only one passage 17 more space for this combustion air and exhaust gas passage and also cooling passages which usually are made in the cylinder head 1 is obtained.

The pressure control valve may be mounted directly in the cylinder head 1. It is of course possible to arrange it at another place also in connection with a suitable pipe or hose. Since the pressure valve and the fuel can be taken out at the forward side of the cylinder head 1 which usually slopes somewhat backwards, the problem with air in the fuel passage is also solved since this air can simply be allowed to escape at the forward side, which is the highest point in the system.

Fig. 3 shows only the cylinder head 1 seen both from above and through the sections B-B and A-A. Six cavities 18 are drilled or shaped in some other way in the cylinder head 1 and these cavities end in an opening 19 through which the fuel injector protrudes into the engine cavity. At both ends of the cylinder head 1 transverse fuel passages 20 are arranged. These transverse passages 20 have been made to allow the supply of fuel to be arranged in different ways. One or two of the passages 20 may be used and the others may be plugged or all may be plugged and the fuel supplied directly into the passage 17.

Through the present invention several different advantages compared to the cylinder heads which are manufactured according to the prior art having two narrow passages are accordingly obtained. It is easy to drill the passage in the longitudinal direction of the cylinder head but other manufacturing methods such as moulding or alternative working methods may also be used. The cylinder head according to the invention has also been made more compatible with other systems since the fuel supply may be arranged from the side or from above.

By correctly arranging a fuel passage having a size of 10-15 mm in the cylinder head a construction of the inlet and exhaust passages in the motor having minimized flow

disturbances is made possible. This can be used to improve efficiency of the motor.

The incidence of rejects due to the fact that the direction of the drilling of the passages 3 and 4 cannot be correctly maintained is eliminated. The time for making one passage instead of two is shorter and a lower total manufacturing cost can be obtained. The number of deburring points in each injection cavity is halved, which results in a shorter manufacturing time and consequently lowered manufacturing cost. Only one fuel passage and a motor so arranged that the fuel outlet may occur in the forward part of the cylinder head makes it possible to correctly transport possible gases. Handling in connection with, for example, repairs is substantially improved. The engine can in this case without problems have a somewhat backwards sloping position. One passage having, for example, a diameter of 12,5 mm and a length of 1 m gives a smaller projected surface, namely about 39 000 mm^2 compared with two passages of 9.5 mm, which gives a projected surface of about 60 000 mm^2. A decreased surface gives a lower heat transfer and thus less influence on the properties of the fuel. The risk of operational disturbances and damage to the components of the fuel system is therefore lowered.

The invention is not limited to the embodiment example but can be varied in different ways within the scope of the claims.

CLAIMS:

1. Elongated cylinder head (1) for mounting on, for example, a diesel engine having cavities (19) for injection units (2) and for feeding arrangements for liquid fuel such as diesel oil to the units, in addition to possible usual air and cooling passages, c h a r a c t e r i z e d b y only one longitudinal fuel passage (17) for feeding and removal of fuel to all injection units (2).

2. Longitudinal cylinder head according to claim 1, c h a r a c t e r i z e d i n that the fuel passage (17) exits into one or both of the shorter sides of the elongated cylinder head (1).

3. Longitudinal cylinder head according to claim 1, c h a r a c t e r i z e d i n that one or more transverse passages (20) for supply or removal of fuel to or from the longitudinal fuel passage (17) are arranged at one or both ends of the longitudinal fuel passage (17).

4. Longitudinal cylinder head (1) according to any of claims 1-3, c h a r a c t e r i z e d i n that a valve (11) for controlling the pressure of the fuel in the longitudinal fuel passage (17) is arranged therein at the outlet end for the fuel or outside this.

5. Longitudinal cylinder head (1) according to any of the preceding claims, c h a r a c t e r i z e d i n that the longitudinal fuel passage (17) has a diameter of 10-15 mm.

6. Longitudinal cylinder head (1) according to any of the preceding claims, c h a r a c t e r i z e d i n that only two surfaces for sealing against O-rings (7) mounted on the injection units are made in each cavity (18) for the injection units (2), one above and one below the inlet and outlet openings for the longitudinal fuel passage (17).

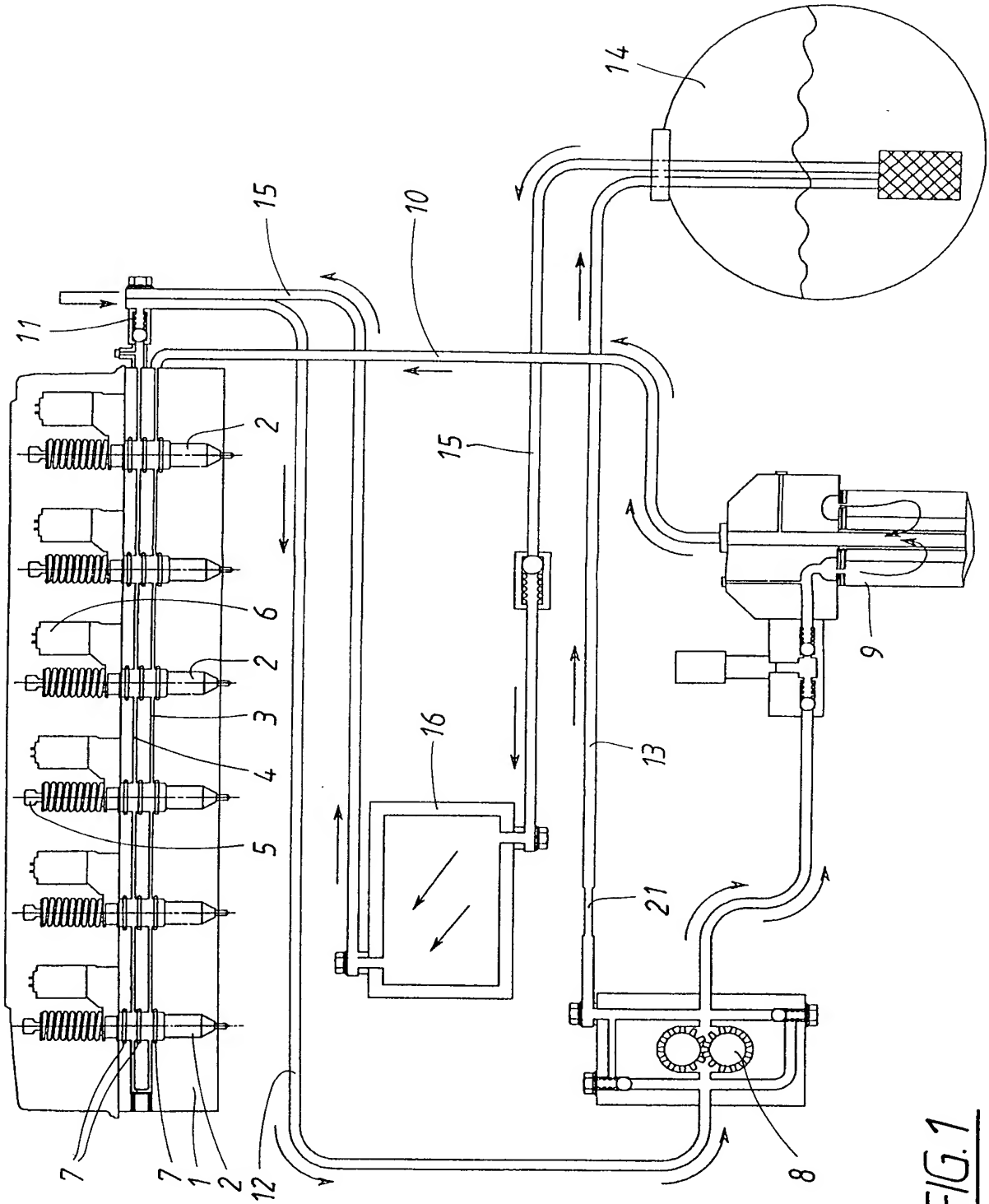


FIG. 1

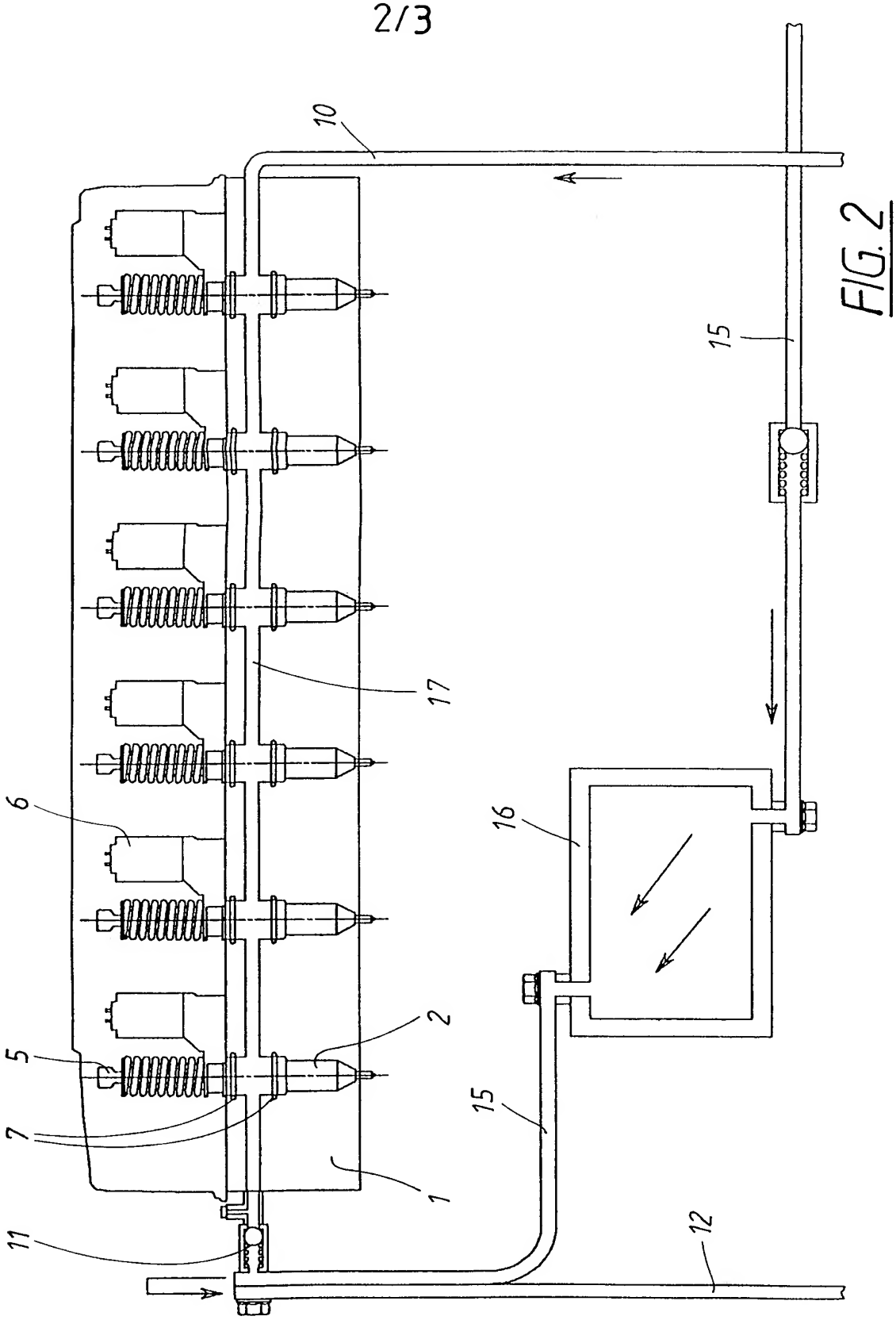
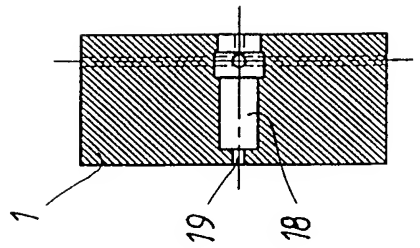
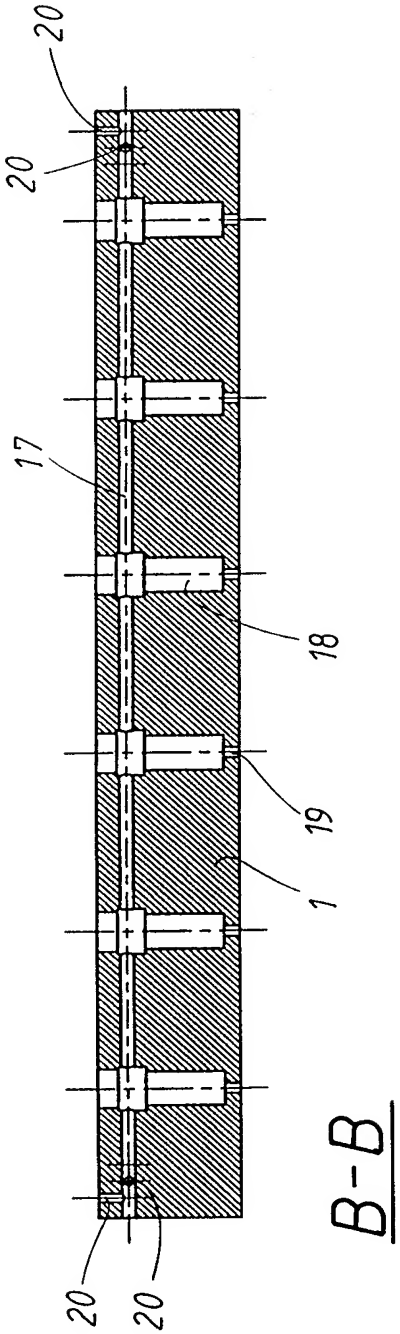


FIG. 2



A-A



B-B

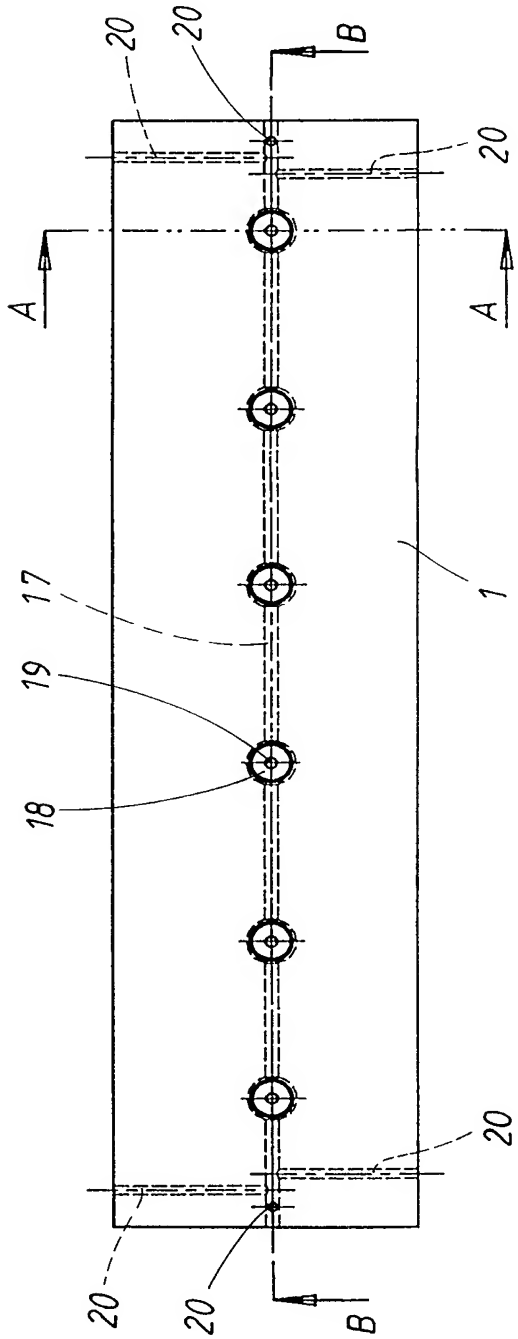


FIG.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 97/01602

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: F02F 1/24, F02M 55/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: F02F, F02M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 4241374 A1 (KLÖCKNER-HUMBOLDT-DEUTZ AG), 16 June 1994 (16.06.94), column 2, line 50 - line 63, figure 1	1-6
A	DE 826216 C (RICHARD SEIFERT ET AL), 27 December 1951 (27.12.51)	1-3,5,6
A	SE 468719 B (SAAB-SCANIA AB), 8 March 1993 (08.03.93)	1-3,5,6

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INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/97

International application No.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4241374 A1	16/06/94	NONE	
DE 826216 C	27/12/51	NONE	
SE 468719 B	08/03/93	DE 4292209 T	15/07/93
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